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10/091,680	03/05/2002	Jiang Hsieh	120335	7220

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EXAMINER	
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ART UNIT	PAPER NUMBER
3737	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/091,680	HSIEH, JIANG	
	Examiner	Art Unit	
	A. LAURITZEN	3737	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *05 November 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *4,5,7-12,16,17,19-21 and 25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *4,7,8,9,10,11,12,16,19,20,21 and 25* is/are rejected.

7)☒ Claim(s) *5 and 17* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

This action is in response to communications filed 5 November 2007. Amendment(s) to independent claim(s) to specify "wherein each of a plurality of values of the estimated gradient is a function of a plurality of values of the reconstructed images," are taken to have support at [0022], [0025], in which a parameter is a function of the detector angle and/or the projected angle.

Response to Arguments

Applicant's arguments have been fully considered but they are not persuasive. Claims have been amended to specify that the gradient is a function of a plurality of values. In the case of Snyder, a gradient is calculated for each of the pixels in the original image, based on noise reduction parameters (col. 1, lines 62-67). For each generation of new images pixels in the gradient image are examined and a histogram of gradient values is calculated for each image as the each new image is acquired among the plurality of images, based on multiple code values (col. 2, lines 8-14). The multiple images (slices) of Snyder are represented by a spacing, s. In the case of Florent et al., the calculated image (analogous to the gradient image calculation of Snyder) is a function of tilting angle, panning angle and a scale factor (abstract; col. 2, lines 42-56; col. 6, lines 59-67).

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1. Claims 4, 7, 8, 9, 10, 11, 12, 16, 19, 20, 21 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mattson et al. (U.S. Patent No. 5,229,934) in view of Snyder et al. (U.S. Patent No. 5,923,775), Labaere et al. (U.S. Patent No. 5,717,791) and Toth et al. (U.S. Patent No. 6,115,487), and further in view of Florent et al. (U.S. Patent No. 5,594,845).

Mattson et al. disclose a method and computer, which is used in a CT system having a radiation source and detector array for rotation over a plurality of slices each having a spacing therebetween, for reconstructing an image that includes producing an error projection using a gradient image, where the error projection is produced by forward projecting the gradient along a projection view angle (based upon, or a function of, at least this parameter), where the error projection is used to construct an error image and where a final image is generated by subtracting the error image from the original image (col. 3, lines 11-14, 18-24, and 55-59; col. 4, lines 49-64; col. 5, lines 8-10 and col. 6, lines 13-17 and 34-38). Mattson et al. does not teach using an estimated gradient to generate the gradient image, where the gradient image represents a variation of the high density object in z, where the gradient is produced by comparing three or more images with some threshold value, or using a segmentation technique to produce different

gradient images, where the technique involves using different threshold values for different classes of objects.

In the same field of endeavor, Snyder et al. teach a gradient estimation system that is used to estimate a gradient by comparing three or more images to a threshold value to produce a gradient image, which can then be used in image reconstruction (col. 1, lines 65-67, col. 2, lines 8-9 and 14-20 and col. 3, lines 29-35). Snyder et al. further teach the use of a segmentation technique to produce different gradient images where the segmentation technique provides a plurality of threshold values (col. 3, lines 40-44 and col. 5, lines 25-52), with a gradient calculated for each of the pixels in the original image, based on noise reduction parameters (col. 1, lines 62-67). For each generation of new images pixels in the gradient image are examined and a histogram of gradient values is calculated for each image as the each new image is acquired among the plurality of images, based on multiple code values (col. 2, lines 8-14). The multiple images (slices) of Snyder are represented by a spacing, s. Also in the same field of endeavor, Labaere et al. teach use of gradient images corresponding to sharp variations, such as between tissue and bone (col. 1, lines 60-67 and col. 2, lines 1-4 and 53-67). These are analogous to the segmentation techniques taught by Snyder et al. It would have been obvious to one of ordinary skill in the art at the time of the invention to have used the techniques of Snyder et al. to produce the gradient images, such as those in Labaere et al., used in Mattson et al. to estimate and reduce the noise or artifacts in image slices and thereby improve image quality (see for motivation Mattson et al. at col. 1, lines 7-15 and the title, Snyder et al. at col. 1, lines 21-30 and 60-61 and col. 3, lines 29-38 and Labaere et al. at col. 2, lines 64-67).

Mattson et al., Snyder et al. and Labaere et al. also do not teach that the error candidate image is scaled based upon the view angle or that it is helically weighted. In the same field of endeavor, Toth et al. provides a correction method where the error image is scaled corresponding to the angle and a method using helically weighted error data (col. 2, lines 13-21, 42-46 and 54-63). It would have been obvious to one of ordinary skill in the art at the time of the invention to have scaled or weighted the error image of Mattson et al. with the method of Toth et al. in order to improve the error correction process (see for motivation Toth et al. at col. 6, lines 24-39).

Mattson et al., Snyder et al., Labaere et al. and Toth et al. teach all of the features of the present invention except for expressly stating that the scaling of the error projection was based upon the projection view angle, center view angle, pitch and size of the detector array. In the same field of the endeavor, Florent et al. teaches an image processing method, using projections, where scaling is based upon the panning angle, the center angle, the tilting angle and the size (col. 2, lines 42-62 and col. 5, lines 39-47). Here, the Examiner has interpreted the dependence of the scaling on the number of pixels in the target array as equivalent to Applicant's use of detector array size. It would have been obvious to one of ordinary skill in the art at the time of the invention to use the scaling scheme from Florent et al. in the scaling method of Toth et al. in order to reduce the complexity of the image processing method (see for motivation Toth et al. at col. 1, lines 56-59 and Florent et al. at col. 2, lines 32-38).

4. Claims 9 and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mattson et al. in view of Snyder et al., Labaere et al., Toth et al. and Florent et al., as applied to Claims 4 and 16 above, and further in view of Moore (U.S. Patent No. 4,222,104).

Mattson et al. in view of Snyder et al., Labaere et al., Toth et al. and Florent et al. teaches all of the features of the present invention except for explicitly stating that the forward projection of the gradient is either a fan beam or parallel beam forward projection. In the same field of endeavor, Moore teaches that parallel beam forward projections are very well known in image processing techniques (col. 7, lines 12-19). It would have been obvious to one of ordinary skill in the art at the time of the invention to have generated the error image from the gradient image through the use of a parallel beam forward projection in order to provide a simple procedure for the generation of the image (see for motivation Moore at col. 4, lines 8-19).

Allowable Subject Matter

5. Claims 5 and 17 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. The specific methods of scaling with an error fraction and reconstruction of an error image based upon an error-candidate projection of the parameters specifically recited in the claim(s) according to the calculation, in conjunction with the other limitations of the claim (and base claims) as recited is allowable over the prior art.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to A. LAURITZEN whose telephone number is (571) 272-4303. The examiner can normally be reached on Monday - Friday, 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian L. Casler can be reached on (571) 272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/A. L./
Examiner, Art Unit 3737

/Brian L Casler/
Supervisory Patent Examiner, Art Unit 3737